A YANG Model for Network and VPN Service Performance Monitoring

draft-www-opsawg-yang-vpn-service-pm-01

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Background

- Initially discussed in BESS WG
  - This document defines a YANG model for both Network Performance Monitoring and VPN Service Performance Monitoring
    - monitor and manage network performance on the basice network topology (RFC 8345)
    - the service topology between VPN sites
  - Align with VPN Common YANG model
    - Uses import references to VPN Common YANG model
  - Fill the gap identified in the **L2VPN/L3VPN Service Delivery use case defined in draft-ietf-opsawg-model-automation-framework-04**
    - **Provide L3NM/L2NM capability and notification to upper layer.**
- Assumptions
  - **This draft does not introduce new metrics for network performance or mechanisms for measuring network performance.**
  - **This draft exposes network and service layer performance information to consumers of the model (RFC 8345) based on existing measurement protocol**
    - IP traffic performance measurement protocol such as OWAMP, TWAMP
    - IP traffic performance metric such as one way delay, roundtrip delay, loss, PDV
    - MPLS traffic performance measurement such as MPLS loss and delay measurement for MPLS[RFC6374], MPLS-TP loss and delay measurement[RFC6375]
    - Ethernet traffic performance measurement such as Y.1731

Fill the gap identified from L2VPN/L3VPN Service Delivery

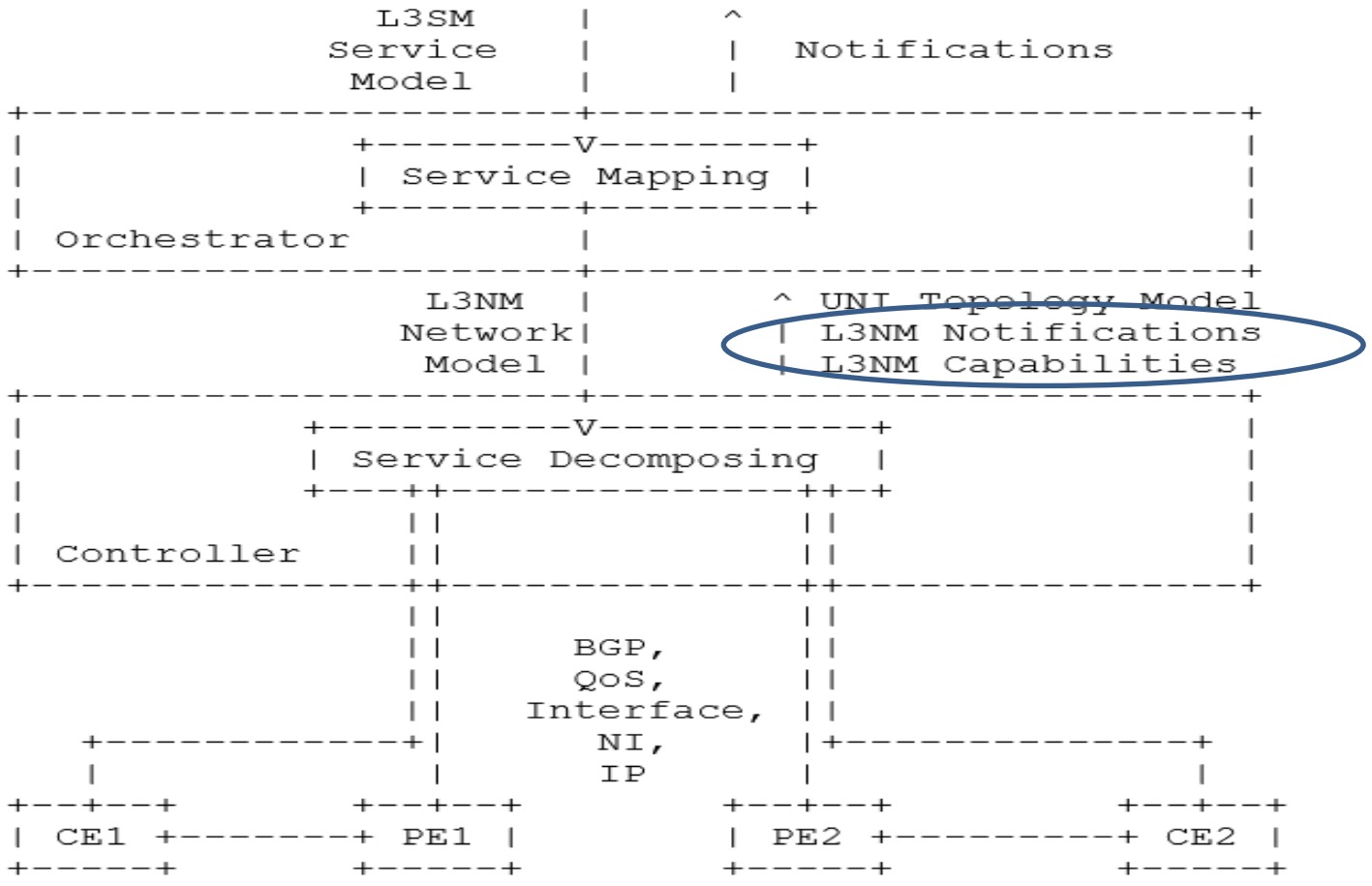


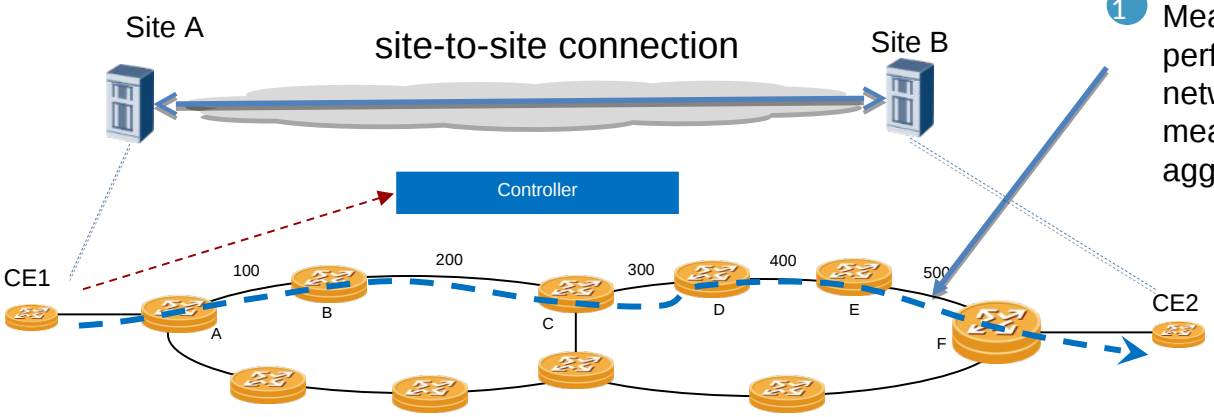
Figure 6: L3VPN Service Delivery Example (Target)

Source： draft-ietf-opsawg-model-automation-framework-04

Use Case: Real Time VPN Service Monitoring

2 Monitor per tunnel network performance report via pub/sub model or on demand RPC retrieval model

3 Optimize network based on VPN service performance monitoring



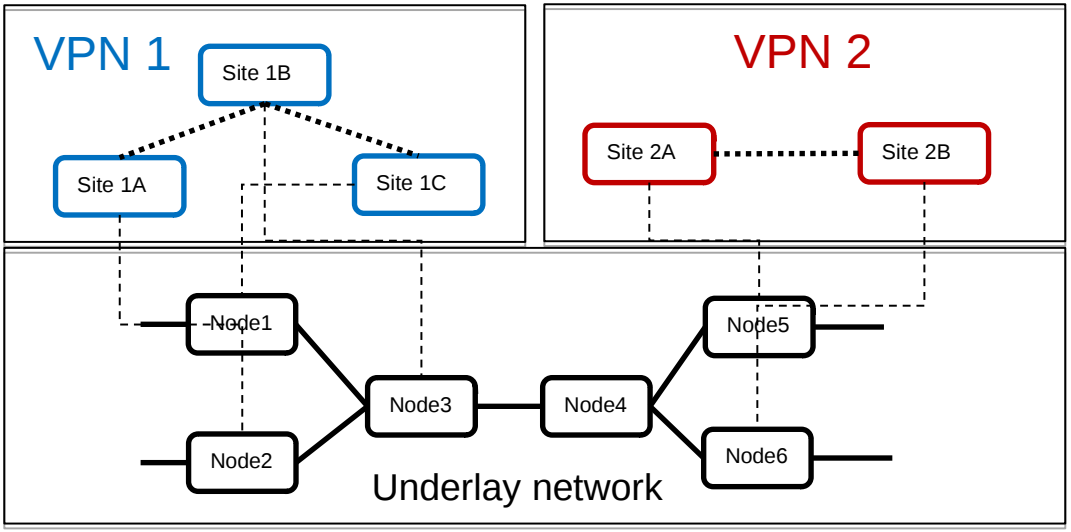
1 Measure per link network performance in the underlying network using MPLS loss and delay measurement method and report in aggregated way.

Network Performance data source: Network device, management system
Performance measurement method: IPPM method, MPLS Loss and Delay Measurement
End to end Network performance calculation method: using PCEP solution [RFC8233] [RFC7471] [RFC7810] [RFC8571]

The goal: Report end to end network performance or service level VPN network performance

- One way delay between PE A in site A and PE F in Site B
- Packet loss between CE1 and PE A in site A
- WAN link bandwidth between CE2 and PE F within Site B

Relationship between VPN service topology and underlay topology



- **Mapping between Overlay and Underaly:**
  - The Site-1,A,B,C are mapped to node (1),(2),(3)
  - while Site-2 A,B are mapped to node (5),(6) in the underlying physical network.
- **VPN-svc 1:** supporting hub-spoke communication for Customer 1 with connecting the customer's access at 3 sites.
- **VPN-svc 2:** supporting any-any communication for Customer 2 with connecting the customer's access at 2 sites

- Establish the relationship between underlay topology and VPN service topology

Model Design Overview

```
module: ietf-network-vpn-pm
  augment /nw:networks/nw:network/nw:network-types:
    +--rw network-technology-type*   identityref
  augment /nw:networks/nw:network:
    +--rw vpn-topo-attributes
    |  +--rw vpn-topology?   identityref
    +--rw vpn-summary-statistics
       +--rw ipv4
       |  +--rw total-routes?          uint32
       |  +--rw total-active-routes?   uint32
       +--rw ipv6
          +--rw total-routes?          uint32
          +--rw total-active-routes?   uint32
  augment /nw:networks/nw:network/nw:node:
    +--rw node-attributes
       +--rw node-type?   identityref
       +--rw site-id?     string
       +--rw site-role?   identityref
  augment /nw:networks/nw:network/nt:link:
    +--rw link-type?                    identityref
    +--rw low-percentile?               percentile
    +--rw middle-percentile?            percentile
    +--rw high-percentile?              percentile
    +--rw reference-time?               yang:date-and-time
    +--rw measurement-interval?         uint32
    +--ro link-telemetry-attributes
       +--ro loss-statistics
       |  +--ro packet-loss-count?          uint32
       |  +--ro loss-ratio?                 percentage
       |  +--ro packet-reorder-count?       uint32
       |  +--ro packets-out-of-seq-count?   uint32
       |  +--ro packets-dup-count?          uint32
       +--ro delay-statistics
       |  +--ro direction?                  identityref
       |  +--ro unit-value?                 identityref
       |  +--ro min-delay-value?            yang:gauge64
       |  +--ro max-delay-value?            yang:gauge64
       |  +--ro low-delay-percentile?       yang:gauge64
       |  +--ro middle-delay-percentile?    yang:gauge64
       |  +--ro high-delay-percentile?      yang:gauge64
       +--ro jitter-statistics
          +--ro unit-value?                 identityref
          +--ro min-jitter-value?           yang:gauge64
          +--ro max-jitter-value?           yang:gauge64
          +--ro low-jitter-percentile?      yang:gauge64
          +--ro middle-jitter-percentile?   yang:gauge64
          +--ro high-jitter-percentile?     yang:gauge64
  augment /nw:networks/nw:network/nw:node/nt:termination-point:
    +--ro tp-telemetry-attributes
       +--ro in-octets?              uint32
       +--ro inbound-unicast?        uint32
       +--ro inbound-nunicast?       uint32
       +--ro inbound-discards?       uint32
       +--ro inbound-errors?         uint32
       +--ro outbound-errors?        uint32
       +--ro in-unknown-protocol?    uint32
       +--ro out-octets?             uint32
       +--ro outbound-unicast?       uint32
       +--ro outbound-nunicast?      uint32
       +--ro outbound-discards?      uint32
       +--ro outbound-qlen?          uint32
```

- Augment Basic Network Topo model
  - with service topology parameters and vpn summary statistics info at network level
  - With site role of service topology parameters at node level
  - With performance attribute at link level and termination-point level
- The measurement interval and reference-time associated with these performance data usually depends on configuration parameters in [RFC8641] .

Performance Monitoring Data Retrieval

1.Retrieval via YANG Push

```
<rpc netconf:message-id="101"
    xmlns:netconf="urn:ietf:params:xml:ns:netconf:base:1.0">
    <establish-subscription
       xmlns="urn:ietf:params:xml:ns:yang:ietf-subscribed-notifications">
       <stream-subtree-filter>
          <networks xmlns="urn:ietf:params:xml:ns:yang:ietf-network-topo">
             <network>
              <network-id>vpn1</network-id>
               <node>
                <node-id>A</node-id>
                <node-type xmlns="urn:ietf:params:xml:ns:yang:ietf-svc-topo">pe</node-type>
               </node>
               <node>
                <node-id>B</node-id>
                <node-type xmlns="urn:ietf:params:xml:ns:yang:ietf-svc-topo">pe</node-type>
               </node>
               <link xmlns="urn:ietf:params:xml:ns:yang:ietf-network-topology">
                <link-id>A-B</link-id>
                <source>
                 <source-node>A</source-node>
                </source>
                <destination>
                 <dest-node>B</dest-node>
                </destination>
                 <svc-telemetry-attributes
                  xmlns="urn:ietf:params:xml:ns:yang:ietf-svc-topo">
                  <loss-statistics>
                   <packet-loss-count/>
                  </loss-statistics>
                 </svc-telemetry-attributes>
               </link>
             </network>
          </networks>
       </stream-subtree-filter>
       <period xmlns="urn:ietf:params:xml:ns:yang:ietf-yang-push:1.0">500</period>
    </establish-subscription>
</rpc>
```

- Use subscription model [RFC8641] to subscribe to their interested network performance data in the data source.

2.On-demand Retrieval via RPC polling model

```
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0"
     message-id="1">
  <report xmlns="urn:ietf:params:xml:ns:yang:example-service-pm-report">
   <networks xmlns="urn:ietf:params:xml:ns:yang:ietf-network-topo">
    <network>
     <network-id>vpn1</network-id>
     <node>
         <node-id>A</node-id>
         <node-type xmlns="urn:ietf:params:xml:ns:yang:ietf-svc-topo">pe</node-type>
     </node>
     <node>
        <node-id>B</node-id>
        <node-type xmlns="urn:ietf:params:xml:ns:yang:ietf-svc-topo">pe</node-type>
     </node>
     <link-id>A-B</link-id>
        <source>
        <source-node>A</source-node>
        </source>
        <destination>
        <dest-node>B</dest-node>
         </destination>
         <svc-telemetry-attributes xmlns="urn:ietf:params:xml:ns:yang:ietf-svc-topo">
         <loss-statistics>
           <packet-loss-count/>
           </loss-statistics>
         </svc-telemetry-attributes>
     </link>
  </report>
</rpc>
```

- Use RPC model to fetch network performance data on demand, e.g., the client requests packet-loss- count between PE1 in site 1 and PE2 in site 2 belonging to VPN1.

Way Forward

- Align with VPN Common Module
  - Import service-type, role, link-type, vpn-topology defined in VPN Common YANG
  - Open question:
    - Should P role, PE role, ASBR role be defined in the vpn common YANG?
- Adoption?
  - The authors believe this draft is a good shape for WG adoption